

**REMARKS*****Status of the claims***

Claims 1-49 are pending. Claims 25-27 and 37-41 were previously withdrawn from consideration in response to the restriction requirement mailed on July 12, 2004. Applicants elected claims 1-24 and 49 for searching purposes, in response to an election of species requirement. Applicants respectfully reiterate their request for inclusion of additional species upon allowance of a generic claim, as set forth in 37 C.F.R. §1.141(a).

By virtue of this response, claims 1, 10-12, 23-25, 28, 32, 37, 40-42, and 45 have been amended. Support for the amendment to claims 1, 28, 42, and 45 may be found in the specification, for example, in paragraphs [0013], [0046], and [0047]. The specification has been amended to shorten the Abstract and to update status of an application listed in the section entitled "Cross-Reference to Related Applications." No new matter has been added by the foregoing amendments.

With respect to any claim amendments or cancellations, Applicants have not dedicated to the public or abandoned any unclaimed subject matter and moreover have not acquiesced to any rejections and/or objections made by the Patent Office. Applicants expressly reserve the right to pursue prosecution of any presently excluded subject matter or claim embodiments in one or more future continuation and/or divisional application(s).

***Request for Rejoinder***

Applicants respectfully request rejoinder of withdrawn method claims 25-27 and 37-41 upon allowance of the elected apparatus claims, in accordance with MPEP §821.04 ("Where product and process claims drawn to independent and distinct inventions are presented in the same application, applicant may be called upon under 35 U.S.C. 121 to elect claims to either the product or process. . . . However, if applicant elects claims directed to the product, and a product claim is

### **AMENDMENTS TO THE DRAWINGS**

The attached sheets of drawings include changes to Figures 1, 3, 7, and 10. These sheets, which include Figures 1, 3, 7, 10A, and 10B, replace the original sheets including the same figures, and are designated "Replacement Sheet" in the header of each drawing sheet.

Attachments: Replacement Sheets for Figures 1, 3, 7, and 10

subsequently found allowable, withdrawn process claims which depend from or otherwise include all the limitations of the allowable product claim will be rejoined.”) Claims 25-27 and 37-41 as amended depend from the product (apparatus) claims pending in the instant application. Applicants respectfully request rejoinder of these method claims upon allowance of the product claims from which they depend.

### ***Information Disclosure Statement***

Applicants appreciate the Examiner initialing and returning the Form 1449's that accompanied the Information Disclosure Statements submitted on April 17, 2002, December 6, 2002, and October 12, 2004.

On the Form 1449 for the Information Disclosure Statement submitted on April 17, 2002, the Examiner indicated that he was unable to review reference 20. Another copy of this reference is submitted herewith for the Examiner's consideration. For the Examiner's convenience, another copy of the Form 1449 that accompanied the April 17, 2002 Information Disclosure Statement is also submitted herewith. Applicants would appreciate the Examiner initialing next to reference 20, indicating that this reference has been considered and made of record in this application.

### ***Drawings***

The drawings were objected to as failing to comply with 37 C.F.R. §1.84(p)(5) because they allegedly include the following reference characters not mentioned in the description: “3” (Figures 1 and 7); “48” (Figure 1); and “64” (Figure 3). Replacement sheets for Figures 1, 3, and 7 are submitted herewith. Figures 1 and 7 have been amended to delete the reference character “3” and Figure 3 has been amended to delete the reference character “64.” However, Applicants respectfully note that reference character “48” is described in the specification on page 10, paragraph [0032]. Therefore, character “48” has not been deleted from Figure 1.

The Examiner has requested that “1-a” and “1-b” in Figure 1 be changed to “1a” and “1b”, respectively. The replacement drawing sheet for Figure 1 includes the requested changes.

The Examiner has requested that formal drawings for Figures 10A and 10B be submitted. Formal drawings for these figures are submitted herewith.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the objections to the drawings.

***Objections to the specification***

The Abstract has been objected to as being longer than 150 words in length. The Abstract as amended herein is shorter than 150 words in length.

The disclosure has been objected to in view of the current status of the related application as abandoned, which is not reflected in the section entitled "Cross-Reference to Related Applications." The specification has been amended to indicate that the status of U.S. Application No. 09/737,268 is "abandoned."

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the objections to the specification.

***Objections to the Claims***

Claims 23 and 24 have been objected to. The Examiner has requested that "the" be changed to "an" before "anode" in claim 23, and that "into" be added after "entry" on the last line of claim 24. The claims have been amended as requested by the Examiner, strictly for clarity and to incorporate the Examiner's preferred language.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the objections to the claims.

***Rejections under 35 U.S.C. §102(b)***

Claims 1, 2, 8-11, 13, 16-24, and 49 have been rejected under 35 U.S.C. §102(b) as allegedly anticipated by Hamada et al., U.S. Patent No. 5,609,834. Applicants respectfully traverse this rejection.

Hamada et al. disclose a reactor in which fuel and air are mixed in a heat transfer zone (4a), and the fuel and air are combusted in a downstream reaction zone (4b) in a combustion channel. The combustion reaction zone is in heat transfer contact with a countercurrent heat transfer zone of a reforming channel (2a), to preheat fuel for a reforming reaction. Downstream of the heat transfer zone of the reforming channel is a reforming reaction zone (2b), which transfers heat with the combustion channel heat transfer zone (4a). Thus, the combustion and reforming reaction zones are not in direct heat transfer contact with each other in the reactor taught by Hamada et al.

In contrast, in the present claims as amended, a combustion reaction is in direct heat transfer contact with a reforming reaction, with exothermic and endothermic reaction catalysts directly opposite one another on opposing surfaces of a conductive separator. The heat generated by an exothermic reaction in one reaction channel is transferred to the endothermic reaction catalyst to provide direct heat for an endothermic reaction in a second reaction channel. In Hamada, the reaction heat generated by an exothermic reaction is transferred to a heat transfer zone upstream from an endothermic reaction zone, rather than directly transferred to the endothermic reaction zone itself. Further, the present claims as amended recite that at least a portion of the separator between endothermic and exothermic reaction channels is corrugated with alternating ridges and grooves. Hamada et al. do not teach or suggest using a corrugated separator between reaction channels.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §102(b).

Claims 1, 2, 3-11, 13, 16-18, 20-24, and 49 have been rejected under 35 U.S.C. §102(b) as allegedly anticipated by Furuya et al., JP 6-111838. Applicants respectfully traverse this rejection.

Figures 1 and 2 of Furuya et al. depict a reactor in which alternate channels have a combustion or reforming catalyst coating the bottom and sides of the channel. The heat of a reaction catalyzed by the combustion catalyst coating at the bottom and sides of one channel transfers heat through a separator wall at the bottom of the channel into the gas phase of the next channel. Heat must transfer through the gas phase before it contacts reforming catalyst at the bottom and sides of an adjacent channel. Furuya et al. do not depict a device in which catalyst coated surfaces are in direct heat transfer contact and on opposite sides of a separator.

In contrast, in the presently claimed invention, heat from an exothermic reaction transfers directly through the separator between adjacent channels to contact an endothermic catalyst coating on the opposite side of the separator. In the present invention, the catalyst in an exothermic reaction zone is in direct heat transfer with the catalyst on the opposite side of the separator in an endothermic reaction zone. Heat from the exothermic reaction catalyst is transferred through the separator and is then transferred directly to the endothermic reaction catalyst, in contrast to the apparatus taught by Furuya et al., in which heat must travel through a gas phase before it reaches the catalyst surface at which an endothermic reaction will take place. Further, the present claims as amended recite that at least a portion of the separator between endothermic and exothermic reaction channels is corrugated with alternating ridges and grooves. Furuya et al. do not depict a corrugated separator between reaction channels.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §102(b).

Claims 1, 2, 8-11, 13, 16-18, 20-24, and 49 were rejected under 35 U.S.C. 102(b) as being anticipated by Nakamura et al., JP 6-219703. Applicants respectfully traverse this rejection.

The present claims as amended recite that at least a portion of the separator between endothermic and exothermic reaction channels is corrugated with alternating ridges and grooves. Nakamura et al. do not teach or suggest using a corrugated separator between reaction channels. Thus, Nakamura et al. do not teach all of the elements of the currently pending claims and this reference does not anticipate the present invention.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §102(b).

Claims 1, 2, 8-11, 13, 16-18, 20-24, and 49 are rejected under 35 U.S.C. §102(b) as allegedly anticipated by Koga et al., U.S. Patent No. 5,015,444. Applicants respectfully traverse this rejection.

As discussed in paragraph [0006] of the present specification, Koga et al. disclose a reactor with alternate chambers *filled* with combustion or reforming catalyst. The separator between combustion and reforming channels does not contain a catalyst *coating* as in the present invention. Koga et al. do not teach a device with a catalyst-coated separator with exothermic and endothermic catalysts on opposite sides of the separator, as presently claimed. Further, the present claims as amended recite that at least a portion of the separator between endothermic and exothermic reaction channels is corrugated with alternating ridges and grooves. Koga et al. do not teach or suggest using a corrugated separator between reaction channels.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §102(b).

***Rejection under 35 U.S.C. §103(a)***

Claims 3-7, 12, 14, and 15 have been rejected under 35 U.S.C. 103(a) as allegedly unpatentable over any one of Hamada et al., Furuya et al., Nakamura et al., or Koga et al. Applicants respectfully traverse this rejection.

The Examiner states on page 8 of the Office Action that each of the cited references individually discloses all of the elements of claim 1, and that the additional elements of the rejected claims would have been obvious to one of ordinary skill in the art. As discussed above, none of the cited references teaches all of the elements of the claims as amended. A combination of these references also does not provide all of the elements of the claimed invention. Therefore, since none of the references, either individually or in combination, teaches all of the elements of claim 1, upon which the rejected claims are dependent, the cited references do not render the claimed invention obvious.

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. §103(a).

### CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, Applicants petition for any required relief including extensions of time and authorize the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952 referencing docket no. 220772007420. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

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Respectfully submitted,

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Attachments